Digital Approaches for the Presentation of Tourist Sites with Historical Significance

Radovesta Stewart[1][0000-0002-3557-3859], Colin Stewart[2]

[1] University "Prof. Dr. Asen Zlatarov", Burgas, Bulgaria
[2] Overhertz Ltd, Burgas, Bulgaria
radadeva@yahoo.com, colin@overhertz.com

Abstract. This paper explores the digital approaches for the presentation of tourist sites with historical significance, focusing on the integration of cutting-edge technologies and innovative strategies. It investigates the use of virtual reality (VR), digital libraries and interactive web platforms to create immersive and interactive experiences for visitors. The paper highlights the benefits of these digital approaches in enhancing tourism, conservation efforts, and cultural understanding. Additionally, it discusses the role of digital representations in preserving both – the tangible and intangible heritage, while also promoting global accessibility, passing down the generations, volunteering and cultural exchange. Through case studies and examples, the paper showcases the transformative potential of digital approaches in presenting and safeguarding cultural heritage.

Keywords: Cultural Heritage, Digital Representation, Web Platforms, Digitization, Tourist Sites.

1   Introduction

The advent of the digital age has revolutionized various aspects of our lives, including the way we explore and engage with the world around us. The realm of tourism, in particular, has witnessed a remarkable transformation with the integration of digital technologies. Tourists today have unprecedented opportunities to experience and interact with tourist sites of historical significance through digital presentations. From cultural monuments and historical sites to majestic fortresses and awe-inspiring landscapes, digital approaches have opened up new avenues for enhancing the visitor experience, preserving cultural heritage, and promoting sustainable tourism.

This paper aims to explore the digital representation of tourist sites with historical significance, focusing on the diverse range of approaches employed to present these sites to a global audience. By leveraging the power of technology, these digital approaches have successfully bridged the gap between past and present, providing immersive, interactive and multilingual experiences for visitors, both on-site and remotely.

Digital representations of cultural monuments and historical sites offer numerous benefits, including accessibility, preservation, education, and enhanced visitor engagement. The advancements in virtual reality (VR), augmented reality (AR), and other digital media have enabled tourists to embark on virtual journeys that transport them to different time periods, allowing them to witness historical events and immerse themselves in the rich heritage of a place. Moreover, the digitization of tourist sites has contributed to the preservation and conservation of delicate structures, artefacts, and artworks, ensuring their long-term survival.

Fortresses, with their rich historical narratives and architectural splendour, have become intriguing subjects for digital representation. In Bulgaria, particularly, only the foundations of fortresses and other large archaeological structures are typically preserved, which make the digital reconstruction of them the only possibility for the general public to comprehend their appearance and scale.

2   Cultural Heritage through Technology

Digital approaches have extended the reach of tourist sites beyond their physical boundaries, allowing a global audience to explore and appreciate their historical significance. Online platforms, interactive websites, and mobile applications provide information, multimedia content, and virtual tours, bringing historical sites to life for individuals who are unable to visit in person. The digital representation has revolutionized the way we engage with cultural heritage. The integration of technology has created immersive and interactive experiences that transcend geographical limitations, enabling individuals to explore and appreciate historical sites in new and exciting ways. This paper will delve into the various digital techniques employed in the presentation of tourist sites, examining their impact on tourism, conservation, and cultural understanding.

Virtual reality (VR) has emerged as a powerful tool in presenting historical sites. By utilizing VR technology (Nagy, et al., 2016), visitors can transcend time and space, immersing themselves in virtual reconstructions of ancient cities and monuments. The ability to explore the streets, interact with historical figures, and witness pivotal moments in history provides a level of engagement and understanding that traditional presentations often struggle to achieve. VR enables visitors to see beyond the ruins or foundations, envisioning the grandeur and significance of these sites as they once stood.

Augmented reality (AR) offers a unique way to layer historical information onto the present environment. With AR applications, visitors can use their mobile devices or specialized glasses to access digital overlays, revealing historical images, facts, and reconstructions within the physical setting. This interactive approach allows for self-guided exploration, giving visitors the freedom to navigate through a site while engaging with multimedia content. By seamlessly blending the past and present, AR provides a captivating and informative experience, enhancing visitors' understanding of the cultural and historical context of a site.

Interactive websites and mobile applications play a crucial role in promoting and disseminating information about tourist sites with historical significance. These platforms serve as digital gateways, offering a wealth of multimedia content, historical

facts, virtual tours, and interactive maps. Visitors can access these resources remotely, enabling them to explore and appreciate historical landmarks even if they are unable to visit in person. The global accessibility provided by these digital platforms fosters cultural exchange, connecting individuals from different parts of the world and cultivating a broader appreciation for diverse heritage.

One of the most significant benefits of digital approaches is their contribution to the preservation and conservation of historical sites. By creating **digital replicas and detailed records of cultural monuments**, fortresses, and archaeological structures, these initiatives ensure the long-term survival of fragile artefacts and architectural features as they no longer need to be exposed to potential danger such physical damage, UV damage etc. Digital presentations also alleviate the strain caused by mass tourism, as visitors can explore virtual replicas without causing physical damage to the sites themselves. Through these digital guardians, we can protect and safeguard our cultural heritage for future generations, ensuring that the stories and significance of these sites endure

3 MusLib Applications and Development

In the past decade the process for digitalisation of tangible and intangible cultural heritage elements has become mainstream, this includes the creation of digital collections, storing thousands of entries of museum objects. An example for this is the platform for digitalization and representation of the collection from Regional historical museum Burgas (Regional historical museum Burgas - MusLib Collection, 2010). It was created in 2018 within the Project "TOGETHER: Common cultural and historical heritage beyond the borders" – CB005.1.21.139, co-funded by the by the European Union trough the Bulgaria–Turkey IPA Cross-border Programme 2014-2020 (Stewart R. , Aquae Calidae MusLib - to connect 20 centuries of history, 2018). The platform is based on the MusLib software, which already was introduced in Regional historical museum Yambol (Stewart R. , Problems of storage and preservation of museum values - digital repositories, 2015) as a modern replacement for their old and outdated digital library which contained over 8000 entries.

MusLib is a comprehensive server and client software solution designed to effortlessly integrate with the MusLib ontology, providing efficient storage and organization of digitalized objects and collections.

MusLib initially emerged as a rudimentary server-client software framework that laid the groundwork for secure data access and editing. In its nascent stage, it functioned as a simplistic yet reliable database management eco-system, employing a row-by-row storage approach to ensure the integrity and consistency of data accessed by its users. However, as MusLib matured and its user base expanded, the software's versatility and capabilities had to evolve to meet the growing demands of various applications and adhere to specific data storage standards prevalent in the industry.

With each subsequent version, MusLib underwent significant improvements and refinements to enhance its functionality and accommodate a wider range of use cases. One key advancement was the implementation of a dynamic schema, a pivotal archi-

tectural enhancement that revolutionized data storage within the system. This innovative approach enabled the storage of an extensive array of entries, each possessing distinct fields and data types. By embracing the dynamic schema, MusLib transcended the confines of traditional data storage methods and embraced a more flexible and adaptive structure, empowering users to tailor the software to their unique requirements.

As MusLib continued to mature, new ontologies were incorporated for testing purposes. By introducing these additional ontological frameworks, MusLib gained the ability to handle increasingly complex relationships and interdependencies among various entries and collections. Notably, this evolution led to the ground-breaking integration of circular references within the system. This significant breakthrough represented a paradigm shift in data storage capabilities, as MusLib transcended the conventional limitations and entered a realm of virtually limitless possibilities in storing and leveraging data pertaining to diverse tangible and intangible entities.

The introduction of circular references in MusLib unlocked unprecedented potential for data management. It enabled the establishment of intricate connections between different entries and collections, creating a web-like network of interrelated data points. This network could capture and represent multifaceted relationships between entities, leading to enhanced insights and a deeper understanding of complex information.

With the incorporation of circular references, MusLib gained the capacity to navigate and traverse this intricate network, enabling users to perform advanced queries and analysis. The software now possessed the capability to explore intricate hierarchies, track complex associations, and unlock deeper layers of data interconnectivity. This advanced functionality propelled MusLib into a class of highly sophisticated database management systems, positioning it as a valuable tool for managing intricate data ecosystems across a wide range of domains.

Initially developed with a focus on museums, MusLib has evolved to support various ontologies, making it adaptable to a wide range of domains, including natural science and intangible cultural heritage. In conclusion, MusLib's evolution from a basic server-client software to a powerful and adaptable data management platform showcases its commitment to addressing the evolving needs of its users. Through the incorporation of dynamic schemas, integration of new ontologies, and the introduction of circular references, MusLib has surpassed conventional database systems, offering unparalleled flexibility and an extensive array of possibilities for storing, organizing, and utilizing data across diverse tangible and intangible entities.

This paper explores the versatility of MusLib and its ability to accommodate diverse ontologies, highlighting working examples such as Orchis, NatureIdentify, Eurica, and the digital collection of the community centre Prosveta 1927 – Kameno.

3.1 Seamless Integration with Multiple Ontologies

MusLib stands out for its seamless integration with different ontologies, enabling the storage and organization of diverse digital objects and collections. By design, MusLib can accommodate new ontologies without requiring any modifications to the software, providing flexibility and ease of use. This feature proves invaluable when it comes to digitally presenting various forms of intangible cultural heritage, as it allows for the

integration of specific ontologies tailored to the unique characteristics of these heritage elements.

One of the standout features of the later versions is the custom pre-processor that employs the Lua script language to facilitate the hassle-free addition of new pages for the client and API functionality. This feature allows for the easy creation of an entire website that can be hosted on MusLib software to provide publicly accessible information about different collections and/or objects aiding the fast and simple integration for community centres' heritage collections which typically lack the resources, manpower or skills to maintain complex digital platforms.

Although MusLib's primer ontology (R. Stewart, 2019) shares a similar structure with the ontology of the multimedia digital library "Virtual encyclopaedia of the Bulgarian iconography" (BIDL) (Pavlova-Draganova, Georgiev, & Draganov, 2007), its target and purpose differ significantly. The ontology employed in BIDL focuses specifically on the registration, documentation, and virtual exploration of icons (Pavlov, Paneva-Marinnova, Goynov, & Pavlova-Draganova, 2010), which are a distinct type of object with unique characteristics. In contrast, MusLib's objective was to develop and implement a foundational standard ontology capable of encompassing all types of objects, serving as a template for museum digital libraries in accordance with Bulgarian national legislation.

The general aim of MusLib was to create a versatile ontology that could accommodate various objects found in museum collections. By adhering to the Bulgarian national legislation, MusLib ensures that the data produced by other software employing the same ontology remains compatible, durable, and easily communicated, exchanged, or shared. This compatibility allows for seamless interoperability among different software applications, facilitating the integration and utilization of data across multiple platforms. MusLib's base standard ontology serves as a unifying framework, enabling museums to establish digital libraries that conform to national regulations while promoting data accessibility, consistency, and collaboration within the cultural heritage sector.

3.2 Orchis and NatureIdentify: Expanding into Natural Science

Orchis (Stewart R, 2018) and NatureIdentify (OverHertz, 2019) brought the requirement of storing a complex biological classification system, placing specimens into a classifications that could correlate or interconnect various other entries automatically. As MusLib evolved, it extended its support to ontologies beyond museums. Two notable examples are Orchis and NatureIdentify, dedicated platforms in the field of natural science. Orchis is a digital tool created within the project "ORCHIS - Orchids researches, conservation and habitats in Strandzha", CB005.1.12.025 - which focused on the digitization and organization of botanical collections through the implementation of field surveys in the regions around Malko Tarnovo (Bulgaria) and Demirköy (Turkey). This project envisioned the development and implementation of specialized software that effectively worked with collected and updated information about orchids in the Strandzha region. It included detailed data such as pictures, coordinates, descriptions, and population sizes of wild orchids. This comprehensive dataset is stored and

organized within the MusLib platform. The specialized software not only facilitates the storage and retrieval of valuable information but also allows for the appending of new data remotely on-site. This approach aimed to ensure the increased sustainability of the results and enable effective monitoring of orchid populations over time. Similarly, NatureIdentify utilizes MusLib's infrastructure to create a comprehensive digital platform for the identification and classification of flora and fauna with data submitted voluntarily by platform users from around the world. The seamless integration with MusLib ensures consistency, scalability, and interoperability within the natural science domain.

3.3   Eurica: Digitizing Traditional Recipes

Eurica (Stewart C. J., 2022) was a continuation of the Digicult project, which worked on the development of methods for digitalization by matching together different elements of the intangible cultural heritage. Both projects used MusLib as a platform and its quick adaptability to extend to intangible cultural heritage. Eurica focuses on the digitization of traditional recipes from different parts of Europe, capturing the culinary heritage of diverse regions. MusLib's integration with Eurica allows for the efficient storage, organization, and retrieval of digitalized recipes, enriching cultural understanding and preserving culinary traditions. By leveraging MusLib's ontology, the platform provides cultural exchange and appreciation, that was adopted within the project EuRiCa: Europe ritual cuisine – digital presentation and preservation, 2020-1-BG01-KA202-079046, funded by the European Union through the Erasmus+ Programme by the Bulgarian National Agency.

3.4   Prosveta 1927 – Kameno: Preserving Community Heritage

Another noteworthy example of MusLib's versatility is evident in its collaboration with the digital collection of the community centre Prosveta 1927 – Kameno (PROSVETA1927, 2022). The integration was a result of the project "Development and promotion of identity on the territory of FLAG from the Strategy for community-led local development of FLAG Burgas - Kameno", procedure: BG14MFOP001-4.030, funded by the Maritime Affairs and Fisheries Program 2014-2020. The platform integrated with MusLib offered a modern approach towards the preservation and showcasing of its community's heritage, encompassing historical documents, photographs, artefacts, and cultural materials. MusLib's ontology provides the framework to organize, store, and access these digitalized assets, ensuring their long-term preservation and enabling broader public engagement with the community's history.

3.5   Thrace.site

The latest integration of MusLib is in the cultural heritage tourism web platform www.thrace.site. It was created within the project "Living Ancient Towns - Asagipinar and Rusokastro", CB005.2.21.059, funded from the European Union through the interreg-IPA Cross-border Cooperation Bulgaria-Turkey Programme 2014-2020 (CCI No. 2014TC16I5CB005). "Thrace" was chosen for the name of the web portal because it is

collective and unifies the territory on the Balkan Peninsula, locked between the Balkans Mountains, the Black Sea, the Marmara Sea and the mountain ranges to the west, regardless of today's political borders. This area has its common cultural and historical heritage from prehistory to the present day. The platform offers space and resources for the presentation of cultural heritage sites within this region. They are represented under the MusLib standard ontology but also can offer additional experience and services for tour operators and tourists. The platform gives opportunity for the tour operator to ensemble their joint product and offer it on the platform with direct connection to the multilingual information for the cultural heritage sites, that can be added with guide tours, representations, videos, maps and 3D models. The next step towards extending the thrace.site (Kameno, 2021) portal is to add full representations of the historical place. This process will start with creating a digital version of Rusokastro Fortress with the methods for cultural heritage representation mentioned below – development of a 3D model of the fortress for VR environment, AR using digitalised versions of the artefacts found on site and stored in the collection of Regional historical museum Burgas with information provided by the archaeologists, site-mapping with guided tour for tourists in multilanguage versions.

4   Conclusions

In conclusion, the exposition of our investigation highlights the transformative potential of digital approaches that can be used by single platform i.e. MusLib, in the presentation of tourist sites with historical significance. By harnessing the power of virtual reality, augmented reality, interactive platforms, and digital preservation methods, these initiatives create immersive and engaging experiences for visitors, while also contributing to the conservation and global accessibility of our cultural heritage. As technology continues to evolve, these digital frontiers hold the promise of further innovation, enabling us to unravel the mysteries of the past and foster a deeper appreciation for the historical sites that shape our collective identity. Through 3D modelling, visitors can explore the intricate details of fortresses, virtually navigate through their corridors and ramparts, and gain a deeper understanding of their strategic importance and cultural significance in various time periods. Such digital presentations enable tourists to delve into the past and experience the magnificence of these structures, even if they are physically unable to visit them.

Acknowledgements.

References

Kameno, M. (2021). https://thrace.site/

Nagy, J., László Márkus, Z., Kaposi, G., Szántó, G., Szkaliczki, T., & Vass, N. (2016). New Tourist Service Based on Virtual Reality Glasses in the Town of Miskolc, Hungary. *Digital Presentation and Preservation of Cultural and Scientific Heritage, 6,* 81–92. https://doi.org/10.55630/dipp.2016.6.8

OverHertz. (2019). http://www.natureidentify.com/

Pavlov, R., Paneva-Marinnova, D., Goynov, M., & Pavlova-Draganova, L. (2010). Services for Content Creation and Presentation in an Iconographical Digital Library. *Serdica Journal of Computing, 4*(2), 279-292. https://doi.org/10.55630/sjc.2010.4.279-292

Pavlova-Draganova, L., Georgiev, V., & Draganov, L. (2007). Virtual Encyclopaedia of Bulgarian Iconography. *International Journal "Information Technologies&Knowledge", 1*(3), 267-271.

PROSVETA1927, C. C. (2022). https://thrace.site/collections

Stewart, R., Simeonov, S., & Pavlov, R. (2019). Development of base ontology for a digital library of the Bulgarian museums' collections. In *Proceedings of the 9th Balkan Conference on Informatics (BCI'19)* (Article 5, pp. 1–4). https://doi.org/10.1145/3351556.3351581

Regional historical museum Burgas - MusLib *Collection*. (2010). https://burgasmuseums.bg/bg/collections

Stewart, R., Zhelev, Y., & Monova-Zheleva, M. (2018). ORCHIS - Technology in Help of Botanists and Foresters on Both Sides of the Border. *Digital Presentation and Preservation of Cultural and Scientific Heritage, 8,* 225–232. https://doi.org/10.55630/dipp.2018.8.23

Stewart, C. J. (2022). *EuRiCa project*. https://eurica.eu/

Stewart, R. (2015). Problemi na sahranenieto i opazvaneto na muzeynite tsennosti – digitalni fondohranilishta. [Problems of storage and preservation of museum valuables - digital repositories]. In *Dobri praktiki : Sahranenie i opazvane na dvizhimite kulturni tsennosti. Modernizirane na muzeynite fondohranilishta : Dokladi ot natsionalna sreshta-seminar, 23-25 septemvri 2015 g., YAmbol* [Good practices: Storage and protection of movable cultural assets : Modernization of museum repositories : Reports from a national meeting-seminar, September 23-25, 2015, Yambol] (pp. 137-148).

Stewart, R. (2018). Aquae Calidae MusLib - to Connect 20 Centuries of History. *Digital Presentation and Preservation of Cultural and Scientific Heritage, 8,* 207–212. https://doi.org/10.55630/dipp.2018.8.20